

CONTROL FOR A ROOF ASSEMBLY OF A VEHICLE, ROOF ASSEMBLY AND METHOD  
OF CONTROLLING A ROOF ASSEMBLY

BACKGROUND OF THE INVENTION

The invention relates to a control for a roof assembly of a vehicle. More particularly, the present invention relates to a control for a roof assembly of a vehicle having several roof members (1-4), which are individually drivable by drive motors. Such control, roof assembly and method of this kind are known from DE-C-44 11 388 (US-A-5,749,617). Other examples of prior art controls are known from DE-A-199 26 521 and US-A-6,056,352.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an improved control, roof assembly and method of the type referred to in the introduction.

According to one aspect of the invention, a control for a roof assembly of a vehicle is provided. The roof assembly includes several roof members which are individually drivable by drive motors. The control includes a control unit programmed to control the drive motors and a switch, having a range of adjustment with pre-selected positions each corresponding to a pre-selected position of the roof members. The switch can be provided with a momentary function to activate the control unit to energize one or more of said drive motors to move one or more of said roof members to the position corresponding to said pre-selected position of said switch. Stated another way, the switch provides means for separate selection of the roof position and activation of the control unit, which leads to a more fool proof and reliable operation of the roof assembly since the roof members start only moving after a selection of the end position has been made.

In one embodiment, it is preferred to construct the switch itself as a push-button, which is actuated in a direction substantially perpendicularly to the range of adjustment of the switch. In this manner, there is no need for a separate push-button,

which is an expensive solution and which provides a very simple and comfortable control.

In order to be able to stop the roof members in intermediate positions, it is proposed according to another aspect of the invention to program the control unit such that it is deactivated when the push-button is depressed during movement of the roof member(s) to their pre-selected position, while it is preferred to program the control unit such that it is activated again when the push-button is depressed in a position of the roof members in which they have not yet reached their pre-selected position indicated by the switch. In this manner the user of the roof assembly may obtain more (intermediate) positions of the roof members than selectable by the switch.

In the event that the control is provided with a pinch safety system for the roof members, an option can include programming or adapting the control unit such that the pinch safety system is overridden if the push-button is held during movement of the roof members. In this way, it is possible to close the roof members, also in situations in which the pinch safety system would prevent closing, for example if the resistance on the roof members is too high due to dirt, misalignment or other undesired causes.

#### BRIEF DESCRIPTION OF THE DRAWING

The invention will be explained in more detail hereafter with reference to the drawings showing an embodiment of the roof assembly and control according to the invention.

Fig. 1 is a schematic illustration showing parts of a roof assembly and a control for controlling the roof assembly.

Fig. 2 is a plan view of a switch for use in the control according to Fig. 1.

#### DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

The drawings show an exemplary embodiment of a roof assembly for a vehicle and a control therefore. In this particular embodiment, the roof assembly includes a front panel 1 and a rear panel 2 as well as a front sunshade 3 and a rear sunshade 4. It will be obvious that many kinds and combinations of other arrangements of

rigid or flexible, transparent or non-transparent roof members are conceivable. The roof members may also be part of a convertible roof. In this manner, the roof assembly is illustrated schematically and should not be considered limiting.

5         In the embodiment illustrated, all roof members 1-4 have their own electric motors 5 each connected to a power source such as a battery (not shown) and connected to a control unit 6 which is adapted to provide control signals to the electric motors 5 in a programmed manner.

10         A control element 7 herein exemplified in the form of a switch is connected to the control unit 6 to provide input signals to the control unit 6. The switch 7 is in this case constructed as a rotary switch, which also has a push-button function, but many other forms such as but not limited to toggle, rocker or slide can be used.  
15         A first operation of the switch, herein exemplified as rotation of the switch 7, is used to make selections for the control unit 6, whereas a second operation, herein momentary operation, of the control element 7 is used to activate and deactivate the control unit 6. The input signals from the control element 7 to the control unit 6  
20         may be generated in any known way, for example by micro-switches or the like.

       Figure 2 shows the switch 7 in a plan view and it shows a grip part 8, which can be gripped by the fingers of a hand in order to press or rotate the switch 7. Around the switch 7 there is  
25         provided a ring showing pictograms 9. These pictograms 9 each show a different position of the roof members of the roof assembly, to which position the control unit 6 will move the roof members 1-4 by their electric motors 5 when a mark 10 on the grip part 8 of the switch 7 is aligned with this particular pictogram. The switch 7 can be  
30         provided with means to click the switch between the pictograms so that the positions of the pictograms are sensed in a tactile manner.

       Another aspect of the invention includes a method of controlling the roof assembly by means of the control, which is as follows.

The user first selects from the pictograms 9 a desired position for the roof members 1-4 of the roof assembly. Then the switch 7 is rotated such that the mark 10 is aligned with the selected pictogram 9 corresponding to the desired position. The switch 7 is then operated in another manner, herein by depressing, in order to activate the control unit 6, which in turn transmits output signals to the electric motors 5 in order to have them move their respective roof members 1-4 to the desired position. However, in a further embodiment, if the user wishes to stop the roof members 1-4 from moving before the selected position is reached, the user can again operate the switch 7 (herein by way of example, depressing) again in order to deactivate the control unit 6. The roof members of the roof assembly will then remain in the position which was occupied during actuation of the switch 7. Further operation of the switch 7 again will reactivate the control unit 6 and the roof members 1-4 will continue moving until the desired position is reached or the switch 7 is again operated.

If another position of the roof members is desired, the switch 7 is rotated to the other desired position shown on pictogram 9 and depressed again to start movement of the roof member(s) 1-4 to the other pre-selected position. In this manner the movements of the roof members of the roof assembly are only started when a final selection has been made, which causes the control unit 6 to transmit the necessary output signals to obtain this position.

If the roof assembly is equipped with a pinch safety system, such as forming part of the control unit 7, which prevents parts of the body or objects to be pinched when a roof member 1-4 is moved to the closed position, as is well known in the art, it may be desirable to sense a hold function of the switch 7. In particular, if the second operation of the switch 7 is maintained, herein by holding the push-button in the depressed state, operation of the motors 5 continues without interference from the pinch safety system. In this way, the pinch safety system is overridden and the roof members are moved to the desired position. Especially if this function is used to close all roof members it is possible that the

speed of the roof member is increased to close the roof assembly quickly. This may be useful in case of an unwanted person trying to get access to the vehicle through the opening of the roof assembly.

The invention is not restricted to the above-described embodiment as shown in the drawing, which can be varied in several ways without departing from the scope of the invention. For example, it is possible to construct the switch assembly as a slide. The second function, which initiates operation of the control 6 to drive the motors 5, can take many forms such as but not limited to a push-button, toggle, rotary or slide, which may be integrated in the sliding switch in a manner similar to that described above, or may be a separate switch (e.g. momentary button) positioned on or next to the sliding switch.